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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/711,320	09/10/2004	Rene Glaise	FR920030066US1	5319

32074   7590   10/31/2007

INTERNATIONAL BUSINESS MACHINES CORPORATION
DEPT. 18G
BLDG. 300-482
2070 ROUTE 52
HOPEWELL JUNCTION, NY 12533

EXAMINER
RUTKOWSKI, JEFFREY M

ART UNIT	PAPER NUMBER
2619	

MAIL DATE	DELIVERY MODE
10/31/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after t he mailing date of this communication, even if timely filed, may re duce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 September 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All b)☐ Some * c)☐ None of:

        1.☒ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____.

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-SB/08) Paper No(s)/Mail Date *12/08/2004, 12/10/2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____ .

DETAILED ACTION

Priority

1.   Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers

have been placed of record in the file.

Claim Rejections - 35 USC § 101

2.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or
> any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and
> requirements of this title.

Claim 14 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-

statutory subject matter. The term "computer-like readable medium" should be changed to

"computer readable medium" per the Interim Guidelines.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

4.   The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459

(1966), that are applied for establishing a background for determining obviousness under 35

U.S.C. 103(a) are summarized as follows:

1.   Determining the scope and contents of the prior art.
2.   Ascertaining the differences between the prior art and the claims at issue.

3.   Resolving the level of ordinary skill in the pertinent art.

4.   Considering objective evidence present in the application indicating obviousness or nonobviousness.

5.   **Claims 1-6 and 8-14** are rejected under 35 U.S.C. 103(a) as being unpatentable over

Wang et al. ("A Distributed Switch Architecture with Dynamic Load-balancing and Parallel

Input-Queued Crossbars for Terabit Switch Fabrics"), hereinafter referred to as Wang, in view of

Wang (US Pat 7,142,555), hereinafter referred to as Wang '555, Sengupta et al. (US Pat

5,355,372), hereinafter referred to as Sengupta and Alasti et al. (US Pat 6,757,246), hereinafter

referred to as Alasti.

6.   For **claims 1, 8, and 9**, Wang teaches a load-balancing method that uses a request-grant

mechanism between Ingress Ports (IP) and Switch Elements (SE) **[page 354, Section D, 2ⁿᵈ**

paragraph and figure 3] (claim 1: wherein a request is transmitted from said IA to one of said

individual switching planes each time a data packet is received in said IA, said data packet being

temporarily stored in said IA, and wherein an acknowledgment is returned from said one of said

individual switching planes to said IA when said data packet can be processed). Request Virtual

Output Queues (RVOQ) are used in the SE to store un-granted requests for later arbitration

[page 354, Section D, 2ⁿᵈ paragraph]. Tracking Virtual Output Queues (TVOQ) are located at

the IP and mirror a respective RVOQ **[page 354, Section D, 3ʳᵈ paragraph]**. The load-

balancing algorithm used by a Load Balance Distributor (LBD), located at each IP **[figure 3]**,

uses a TVOQ_LEN variable to calculate the length of a TVOQ **[page 355, Section E]**

(computing, for each individual plane, the number of data packets waiting to be processed). The

minimum TVOQ length among all switch elements is then found **[page 355, Section E, 2ⁿᵈ**

paragraph]. Finding the minimum queue length is essentially the same as finding the range

since all of the SE queues must be compared in order to find the minimum length, as in the well-known Bubble-Sort algorithm (determining the range of data packets waiting to be processed among all individual switching planes). Wang teaches the SE with the smallest TVOQ among all TVOQs is selected **[page 355, Section E, 3rd paragraph]**. Wang does not teach the use of a predetermined threshold. Wang '555 teaches the predetermined threshold limitation absent from the teachings of Wang by disclosing a load balancing algorithm can use the number of pending requests (absolute number) for a particular SE below a predetermined threshold to determine the optimum SE **[col. 11 line 60 to col. 12 line 2]** (claim 1: comparing said range of data packets waiting to be processed with at least one predetermined threshold; claim 9: wherein said predetermined threshold is an absolute number of packets waiting to be processed). It would have been obvious to a person of ordinary skill in the art at the time of the invention to use a predetermined threshold in Wang's invention to eliminate the need to search every SE TVOQ, since searching every TVOQ could cause too much delay is large switches. Wang does not teach a threshold-exceeded signal. Sengupta teaches the threshold-exceeded signal limitation absent from the teachings of Wang by disclosing a comparator compares a threshold value with a count of a current number of cells in a buffer. The comparator outputs a high signal (alert signal) when the count value exceeds the threshold value **[col. 6 lines 38-50]** (claim 1: signaling each at least one predetermined threshold exceeded; claim 8: wherein said signaling step is used to raise an alert signal depending on which said at least one threshold is exceeded). It would have been obvious to a person of ordinary skill in the art at the time of the invention to use a threshold-exceeded signal in Wang's invention to alert the LBD of an overloaded queue. Wang teaches the use of request-grant mechanism with Asynchronous Transfer Mode (ATM) cells **[page 353, 1st**

paragraph]. Wang does not teach request-grant with packets. Alasti teaches the request-grant packet mechanism absent from the teachings of Wang by disclosing a packet based grant mechanism **[figure 3]**. It would have been obvious to a person of ordinary skill in the art at the time of the invention to use a packet based request grant mechanism in Wang's invention since the same load balancing principles apply to both ATM cells and packets.

7.   For **claim 2**, which depends from **claim 1**, Wang teaches the concept of an up/down counter by disclosing the TVOQ queue length is calculated incrementally with the arrival of cell grants (down) and the generation of cell requests (up) **[page 355, Section E, 3rd paragraph]** (wherein said computing step is automatically performed by an up/down counter incremented with each said transmitted request and decremented with each said returned acknowledgment).

8.   For **claim 3**, which depends from **claim 1**, Wang does not teach the use of a threshold-exceeded signal. The teachings of Sengupta, as explained in the rejection of **claim 1**, disclose the use of a threshold-exceeded signal absent from the teachings of Wang. Sengupta further teaches the buffer from where the count is acquired is an output buffer **55** located on a SE **[figure 6]**. The output of the comparator is sent to a load matrix **40**, where a corresponding load matrix element is changed **[col. 6 lines 44-46]**. The load matrix **40** outputs two signals that give the state of the output buffers in the switch planes **[col. 6 lines 53-56 and figure 7]** (determining which at least one switching plane is responsible for said at least one predetermined threshold exceeded).

9.   It would have been obvious to a person of ordinary skill in the art at the time of the invention to determine which plane is responsible for exceeding a threshold in Wang's invention

to prevent packet loss in the switch. Since an overloaded buffer may discard packets when overloaded.

10.   For **claim 4**, which depends from **claim 3**, Wang's load balancing algorithm is a dynamic algorithm **[page 353, abstract]** (wherein said signaling step and said determining steps are used for triggering the further step of: adapting load balancing over said switching planes).

11.   For **claims 5 and 6**, which depend from **claim 4**, Wang's load balancing algorithm only selects the SE with smallest number of queued requests of all switching elements in a switch **[page 355, Section E, 3rd paragraph]** (claim 5: wherein said adapting step consists in reducing load balancing over said at least one determined switching plane; claim 6: wherein said adapting step consists in skipping said at least one determined switching plane by said load balancing).

12.   For **claim 10**, which depends from **claim 1**, Wang does not teach a relative predetermined threshold. Sengupta teaches the relative threshold limitation absent from the teachings of Wang by disclosing a threshold is between 80 and 90 percent capacity of an output buffer **[col. 5 lines 40-42]** (wherein said predetermined threshold is a relative number of packets waiting to be processed).

13.   It would have been obvious to a person of ordinary skill in the art at the time of the invention to use a relative threshold in Wang's invention since some protocols use variable packet sizes. Therefore, using an absolute number of packets waiting to be processed does not give a clear indication of the amount of buffer capacity used.

14.   For **claims 11 and 12**, which depend from **claims 1 and 11 respectively**, Wang teaches the LBD uses a round-robin scheduler to pick Cell Virtual Output Queues (CVOQ) that are not empty and do not have a full TVOQ **[page 355, Section E, 3rd paragraph]** (claim 11: wherein

the level of occupancy of the switching resources are evaluated beyond said switching planes

down to any identifiable physical switching resource and load balancing performed accordingly;

claim 12: wherein said identifiable physical switching resource is an individual serial link).

15.   For **claim 13**, Wang discloses a distributed switch architecture **[page 353, figure 2]**

(apparatus comprising means adapted for carrying out each step of the method according to

claim 1).

16.   For **claim 14**, Wang discloses a load-balancing algorithm. It is well-known in the art to

implement an algorithm on a computer readable medium **[see claim 1]** (computer-like readable

medium comprising instructions for carrying out each step of the method according to claim 1)

17.   **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view of

Wang '555, Sengupta and Alasti as applied to **claim 1** above, and further in view of Brouwer

(US Pat 6,760,303).

18.   For **claim 7**, which depends from **claim 1**, Wang, Wang '555, Sengupta and Alasti do not

teach the concept of signaling after certain duration of a threshold crossing. Brouwer teaches the

signaling after a duration of a threshold crossing limitation absent from the teachings of Wang,

Wang '555, Sengupta and Alasti by disclosing a timer is used to determine whether a threshold

has been exceeded for a particular amount of time before switching automatically occurs **[col. 6**

lines 50-55] (wherein said signaling step execution is contingent to a minimum duration of a

threshold crossing).

19.   It would have been obvious to a person of ordinary skill in the art at the time of the

invention to wait a certain amount of time after a threshold has been passed in Wang's invention

to take into account traffic bursts.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Jeffrey M. Rutkowski whose telephone number is (571) 270-

1215. The examiner can normally be reached on Monday - Friday 7:30-5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Hassan Kizou can be reached on (571) 272-3088. The fax phone number for the

organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

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applications is available through Private PAIR only. For more information about the PAIR

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information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jeffrey M Rutkowski
Patent Examiner
10/24/2007

HASSAN KIZOU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600